Structural convergence among selected European countries. Multidimensional analysis

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Abstract
The main aim of the paper to test for structural convergence among arbitrary selected European countries. The authors choose four transition economies: Poland, Czech Republic, Hungary and Slovak Republic which are widely recognized as structurally similar economies. All four countries` economy structures are consequently compared with the structure of German economy – here selected as the reference country. The authors want to find out whether it is possible to confirm the hypothesis about the structural convergence between the four selected economies and Germany. The data sample covers the period of 2000-2007. The empirical part of analysis bases on 18 different indicators connected with the economy structure. To verify the hypothesis the authors apply multidimensional taxonomy methods.

Introduction.

The Polish economy is subject to more than 20 years continuous process of transformation, which in the opinion of many economists is still ongoing. Inherent in this process are structural changes in the economy. Therefore, knowledge of the mechanism, the direction and importance of structural changes in the transformations of the Polish economy in enhancing economic growth and development, has in according to the authors the fundamental importance for shaping economic policy. Structural change is not only indispensable element accompanying the process of transformation of the Polish economy, but also an element of the adjustment of our economy to the requirements of the European Union.

On his way to full integration with the European Union and particularly in the context of the planned entry into the euro zone, Poland has to go through the difficult process of convergence in inflation rates, budget deficits and exchange rate. But more importantly is that these processes are inevitably accompanied by changes in the real sector. The process of integration of the Polish economy with the European Union is inevitably associated with

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major structural changes in consumption, investment, foreign trade, but mainly in the production of goods and services. Therefore, today it is important to attempt to answer the question, whether the process of catching-up to the EU15 by the new EU countries such as Poland, Hungary, Slovakia, the Czech Republic is accompanied by processes of convergence or divergence in the structural sphere of production of goods and services. In this context, the purpose of this article is to identify the direction and intensity of processes of structural convergence or divergence (both inter-sectoral and inter-industry convergence) between selected transforming countries of UE 27 and old countries of the EU-15.

1. Structural changes in economics- definition problems.

The crucial question is what processes in the economy can be called the structural changes and what does not.

The concept of "structural changes" is one of those concepts in economics that are repeatedly used but ambiguously defined. According to Silva (2008) in the economic literature, there are at least nine well-known, but differently understood connotation of the term "structural changes". Four of them dominate in economic literature.

Firstly, this term refers to changes in economic structure, understood as a change in the distribution of production activity in the economy, in particular changes in the distribution of production factors in different sectors, employment, economic regions, types of goods and services produced (Machlup 1991). An example of such understanding of the structural change's definition can be the definition created by Jackson (Jackson et al, 1990), who understands structural changes as "temporal changes in interactions among economic sector".

Secondly, equally often structural changes are considered as changes in the meaning of components / constituents (which like consumption, investment, export, import) creating aggregate economic indicators (such as gross domestic product) (Ishikawa (1987)). An example of such an understanding of structural changes can be the definition proposed of M.SyrquinHe defines structural changes in economics as "a long-term persistent changes in the composition of an aggregate"(Syrquin 2010).

Thirdly, it should also pay attention to the use of the term "structural changes" understood as a composition that is difficult to change and are often treated as a constant phenomenon in many econometric models.

Fourthly, last dominant approach to defining the structural changes focuses on understanding them broadly as a process of change not only in economic structure, but

simultaneously in institutions. Especially Nelson treats “institutions as an integral part of any structural changes in the economy” (Nelson 2005).

The above-listed the most common ways of defining the structural changes in the economic literature shows how different and how widely is the term of structural changes understood. The multi aspects of the concept of "structural changes" indicate the connotation to the other economic categories. The bibliometric analysis conducted by EG Silva (2008) shows that the most popular publication related to structural changes in the economy are related to concepts of the development, technological change and innovation, convergence and growth, foreign trade, employment, migration, and growth of industrial production (see table1 and table 2).

TABLE 1.

The most cited authors in the literature of structural change (ordered by average impact)

Author	Number of citations	Number of articles/books	Average impact’ (citations/articles
Schumpeter J	56	16	3.500
Abramovitz M	37	11	3.364
Pasinetti L.	94	28	3.357
Nelson R.R	72	23	3.130
Georgescu-Roegen N	39	15	2.600
Kaldor N	51	20	2.550
Arthur W.B	34	14	2.429
Winter S.G.	52	22	2.364
Fagerberg J.	42	18	2.333
Soete L	41	18	2.278
Leontief W	75	33	2.273
Freeman C.	63	28	2.250
Dosi G	80	37	2.162
David P.A	30	14	2.143
Goodwin R.M	89	42	2.119
Pavitt K.	40	19	2.105
Verspagen B.	44	22	2.000
Baumol W.J.	53	28	1.893
Rosenberg N	37	20	1.850
Wolff E.N	46	25	1.840
Duchin F	44	24	1.833
Punzo L.F.	37	22	1.682

Dum´enil G	32	25	1.280
Orsenigo L.	30	24	1.250
Eliasson G	36	31	1.161

Source: E.G. Silva, A.A Teixeira (2008): Survey structural change: seminal contributions and a bibliometric account. Structural Change and Economic Dynamics pp.276.

Silva analyses citation and co-authoring of papers published in the journal " Structural Change and Economic Dynamics" and all abstracts and articles on structural change analysis published over 40 years in the economic journals (in the Econlit database). The analysis of table 1 with the most cited authors allows to conclude that in economic literature dominate a Schupeterian, neo-Schumpeterian and evolutionary approaches to study structural changes. In the top 10 most cited authors, the first place goes to J. Schupeter, then three authors R.Nelson, N. Georgescu-Roegen, S. Winter represent the group of evolutionary economists, the next three C.Freeman, J.Fragerberg, L.Soete can be classified as new-Schupeterians and the last three authors N.Kaldor, L.Passinetii, M.Abramowitz are the economists of the Post-Keynesians school.

The analysis of table 2 with the most cited studies in the literature of structural changes indicates the most popular approach to the analysis of economic changes. Among papers listed below, the publications of three authors i.e L.Pasinetti, G.Dosi, J. Schumpeter occur most frequently. L. Pasinetti developed the theory of structural change in conjunction with economic growth, G. Dosi and J. Schumpeter in turn focus on structural changes related to technical progress and innovation. Detailed studies suggest that convergence and growth are still most often associated with the analysis of structural changes, although this approach is slowly losing ground to study structural changes in the context of technical change and innovation. In the 1980's 27.6% of all analyzed publications on structural changes related to the convergence and growth, and in 2000's it was only 18.0%. At the same time two other topics have grown in popularity i.e. technical changes and innovation (an increase from 6.9 % to 13.4%) and international trade (growth from 6.6% to 15.4%) (Silva p.279).

TABLE 2.

The most cited studies in the literature of structural changes

Author(s)	Date	Title	Number of citations
Pasinetti L	1981	Structural Change and Economic Growth. A Theoretical Essay on the Dynamics of the Wealth of Nations	27
Nelson R.	1982	An Evolutionary Theory of Economic Change	23
Pasinetti L	1993	Structural economic dynamics; A Theory of the Consequences of Human Learning	17
Georgescu-Roegen	1971	The Entropy Law and the Economic Process	16
Schumpeter J.A	1934	Theory of Economic Development	16
Smith A.	1776	An Inquiry into the Nature and Causes of the Wealth of Nations	16
Sraffa P	1960	Production of Commodities by Means of Commodities	16
Arthur W.B.	1989	Competing technologies, increasing returns, and lock-in by historical events	14
Goodwin R.M.	1967	A growth cycle	14
Keynes J.M	1936	The general theory of employment, interest and money	13
Dosi, G	1988	Sources, Procedures and Micro-economic Effects of Innovation	12
Marx K.	1867	Das Kapital	12
Dosi G	1982	Technological paradigms and technological trajectories	11
Arrow K.J.	1962	The economic implications of learning by doing	11
David P	1985	Clio and the economics of QWERTY	10
Baumol W.J	1967	Macroeconomics of unbalanced growth: the anatomy of urban crisis	10
Freeman C. and Perez C	1988	Structural crisis of adjustment: business cycles and investment behaviour	10
Leontief W	1941	The structure of the American economy, 1919–1929	9
Rosenberg N	1982	Inside the Black Box: Technology and Economics	9
Freeman, C. and Soete, L	1997	The Economics of Industrial Innovation	9
Kaldor N	1966	Causes of the slow rate of economic growth in the UnitedKingdom	9
Ricardo D.	1817	The Principles of Political Economy and Taxation	9
Schumpeter J.A	1942	Capitalism, Socialism and Democracy	9

Source: Source: E.G. Silva, A.A Teixeira (2008): Survey structural change: seminal contributions and a bibliometric account. Structural Change and Economic Dynamics pp.277.

Taking into account the purpose of this article the authors focus on the structural changes associated with the convergence process. Recently in the economic literature appears a new notion which describes the mutually overlapping processes of convergence and structural changes in the economy, known as “the structural convergence”

2. Structural convergence.

By convergence we mean the process of equalization of economic variables between countries, regions or sectors. The economic literature uses the concept of nominal

convergence, understood as a process of equalization of nominal economic variables and real convergence, defined as the tendency to equalize the real economic variables. In addition, the literature distinguishes the concept of sigma convergence (process of decreased dispersion of analyzed variables among different countries over time) and beta convergence (process of approaching analyzed variables to the one point).

In the global economy both the processes of convergence and divergence are observed. In studies of convergence, the most often they relate to real convergence, measured by GDP per capita in purchasing power parity. In the last decade across the world economy strong divergence trends are observed i.e. in 100 countries (covering 90% of the world's population) the income gap increases. In turn, within countries, members of integration groups, the process of decreased dispersion of the level of income between countries is noticed (Matkowski Z.,Próchniak M. (2006). It follows that integration fosters convergence, and that at least three reasons. Firstly, in the integration group poorer countries are characterized by higher productivity of capital, which allows these countries to grow faster than rich countries. Secondly, an intensive process of technological catch-up allows poor countries to decreases a gap to the leaders countries. And thirdly, the accession country to the integration group is associated with the intensification of foreign trade turnover between the two sides, and its benefits flow primarily to the acceding country. All this fosters convergence among members of the integration group. The essential question is whether among the countries (partners of integration groupings) real convergence is accompanied by the phenomenon of structural convergence.

Structural convergence can be viewed at two levels, i.e. as an inter-sectoral convergence and inter-industry convergence. Sector is defined as the most aggregated division of the national economy (agriculture, industry, services), while the industry is less aggregated part of the economy (such as mechanical equipment and leather goods).

As a precursor of theoretical research on **inter-sectoral convergence** can be considered Fourastié (Fourastié 1949) and his economic theory known as the three sector hypothesis. He divides the whole economy into three sectors i.e. extraction of raw materials (primary), manufacturing (secondary), and services (tertiary). Moreover, he believes that each economy on its growth path will change the sector, on which will be based. In countries with low national income, economic activity will focus on the production of raw materials, in the middle stage of development of the country on manufacturing, in turn, when the country reaches the highest level of development will probably be a service economy. Three sector hypothesis leads to the conclusion that countries with similar level of development will be

characterized by a similar inter-sectoral structure. Therefore, the structure of sectors in countries with lower level of development should converge to the structure of countries with higher levels of development.

Additional arguments for the occurrence of inter-sectoral convergence provides Kuznets. In his research he finds a negative correlation between the share of the agriculture sector and the income per capita, simultaneously finding a positive correlation between the shares of the other two sectors and income per capita (Kuznets, 1972). Of course, the process of structural convergence between the countries will never be completed. A certain degree of structural differentiation between countries will always present due to differences in: size of country, factor endowments, culture or in differences in institutional framework (Chenery, 1960). Also, with increasing degree of integration between the economies appear the processes of divergence. The more developed countries are, the more specialized they become, the more structural divergence process will be present between them (Wacziarg 2004).

In turn, few analyses of **inter-industry convergence** don't show clearly the strength and direction of this phenomenon among economies. Economic theories (both traditional and modern) rather points a number of conditions that one side should lead to inter-industry convergence, on the other hand, indicate the conditions contributing to the inter-industry divergence. It appears that, the formed structure of industries in each country largely depends on individual characteristics of particular industries, as well as the individual characteristics of the economy. It is essential for inter-industry structure, if in particular industries exist differences in productivity, externalities, economies of scale or if the analyzed economy is large, have non-tariff barriers or high mobility of workers. Based on economic theories N. Palan, C. Schmiedeberg identifies the following driving forces of inter-industry convergence and divergence. The most important convergence determinants be them are ":

- cost-differential in production between core and periphery (i.e. high wages and rents in the center) letting firms spread to the periphery at very low costs of trade
- increases in labor productivity in lagging countries, i.e. technological catch-up, imitation of new techniques, combined with the slow-down of increase in labor productivity in the leading countries
- outsourcing of agricultural and labor-intensive production in the manufacturing sector from Southern Europe to other countries, i.e. increase in trade with low-wage countries (leading to decline of labor-intensive industries across Europe)

- convergence in demand structures leading to convergence in production, especially in the service sector
- increasing demand for non-standardized products, customized products leading to less specialization and concentration than under mass production
- structural funds for lagging countries by the EU fostering firm localization in the periphery"

In turn, structural's divergence determinants are":

- technological gap (differences in productivity), implying comparative advantages of advanced countries in high tech industries.
- externalities (technological and pecuniary) and input-output-linkages, leading to concentration of production at the center
- high spatial concentration of one specific input factor (natural resources, special skills)
- different industrialization and/or tertiarization patterns
- economies of scale: in large countries the market area is larger and firms can exploit economies of scale better than in smaller countries.
- hub effect, i.e. lower transport costs for economic centers than for peripheries
- home market effects, i.e. more sales in big markets where demand is large.
- economic integration, leading to lower transaction costs and better possibilities to exploit economies of scale
- inter-industry trade caused by economic " (Palan, Schmiedeberg, 2010).

Empirical studies on inter-industry convergence point to the dominance of the processes of specialization and concentration, which mainly contribute to the structural divergence among the industries. However, among the countries of the European Union, where we come to the increased technological catching-up process between the EU15 and other EU countries, one can expect structural convergence within the medium-technology industries. In turn, within the high tech industries, capital intensive as well as within the services will be dominated by the phenomenon of divergence.

3. Structural convergence among selected European countries – quantitative analysis.

In the final section, authors verify the hypothesis about existing structural convergence among selected European countries. The main study concentrates on analyzing the case studies of: Poland, Czech Republic, Hungary and Slovak Republic (Slovakia).

The authors chose the mentioned countries, relying on the assumption on general similarities of their national economies. As it is widely know solely countries with the recognized similar economies shall be compared. The four selected economies belong to the so called transition economies, and all of them are undergoing permanent structural changes since 1990s. The structural changes usually are noticed in the main economy sectors. As mentioned in the article of Giovanni Andrea Cornia "Structural divergence in economies in transition"[3], the four countries belong to the group of countries depended on the export of manufactured goods. As for that the authors` choice is fully justifiable.

The main aim of the analysis run is to learn about the structural adjustments of the cited economies to the arbitrary selected European country. In the case author have decided to chose Germany[4] as the reference country, meaning the one to which the comparisons will be completed.

The analysis covers the time period of 2000-2007. For the years 2008-2010 some essential lacks in data are noted disabling to complete the study. All statistical data is drawn from the OECD STAN Database for Structural Analysis and OECD STAN Bilateral Trade.

The authors have arbitrary decided to chose the following indicators to verify the hypothesis about structural convergence, these are:

1) Value added in selected sectors as share of total value added generated in a given economy,
2) Value added per one person employed in selected sectors of national economy,
3) Share of persons employed in selected sectors to total employment,
4) Share of export value in selected sectors to total export value in a given economy.

There have been made a general division on three widely accepted economy sectors: agriculture, manufacturing and services. Additionally the sector of low technology manufacturing was selected for the analysis. In the case of export values, authors have also chosen – apart from the sectors mentioned above – export value in high technology manufacturing, medium-high technology manufacturing, medium-low technology manufacturing sectors. The full data set covers 18 different indicators[5].

The main aim of the following section is to check the process of structural convergence of Poland's, Czech's, Hungarian's and Slovak's economy with the Germany

[3] Full text of the article is available on http://www.developmentandtransition.net/Article.35+M5fb9c4aa2e3.0.html.

[4] Authors do not claim that Germany is the only one correctly chosen reference country. However, having in mind, that Germany is rather treated as a typical European Union country, and at a time highly developed, authors have decided Germany to be the reference country.

[5] The full data set is put in Annex at the end of the paper.

economy, taking into account preselected indicators. the authors want to verify whether the structure of Polish, Czech, Hungarian and Slovak economy is getting more and more similar to the structure of the German economy.

For the hypothesis verification the authors apply the multidimensional analysis using basic taxonomy methods. The authors calculate the Euclidean metric in 18-dimensional[6] Euclidean space. As different indicators are expressed in different units, all data was standardized. As the result we obtain the so called distance matrix, which let us to know about the relative differences – also understood as inequalities – among objects (countries). The methodology is easily applied when a multidimensionality of analysis is required. It let us to embrace any number of different indicator which are considered to be deceive for the analysis outcomes.

The analysis results have been divided into two parts. In the first one the authors check on the structural convergence on the most aggregate level, while in the second part we check on the structural convergence in particular areas.

a) Structural convergence on the aggregate level.

As it was stated before, the authors have chosen 18 structural indicators for Poland, Czech Republic, Hungary, Slovakia and Germany. We apply the taxonomy methodology to get the results on structural differences among the mentioned economies in the year 2000 and then in 2007.

The indicators included in the analysis are following: VA[7] in agriculture as share of total VA, VA in manufacturing as share of total VA, VA in services as share of total VA, VA in low technology manufacturing as share of total VA, VA in agriculture per person employed, VA in manufacturing per person employed, VA in serviced per person employed, VA in low technology manufacturing per person employed, employment in agriculture as share of total employment, employment in manufacturing as share of total employment, employment in services as share of total employment, employment in low technology manufacturing as share of total employment, export value in agriculture to total export value, export value in manufacturing to total export value, export value in high technology manufacturing to total export value, export value in medium-high technology manufacturing

[6] As there are maximum 18 indicators applied in the joint analysis.
[7] VA – value added.

to total export value, export value in medium-low technology manufacturing to total export value, export value in low technology manufacturing to total export value. The final results of estimations are put in tables 3 and 4 (see below).

TABLE 3.

Aggregate structural differences among selected countries. Reference country – Germany. Year 2000. Distance matrix (Euclidean distance).

	PL	**HU**	**CZ**	**SK**	***D***
PL	**0,0**	**30,8**	**34,5**	**29,0**	***65,8***
HU	30,8	**0,0**	**21,8**	**20,2**	***41,2***
CZ	34,5	21,8	**0,0**	**10,2**	***52,6***
SK	29,0	20,2	10,2	**0,0**	***53,8***
D	65,8	41,2	52,6	53,8	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

Numbers is the matrix above present relative and composite distance among countries. The higher the number the greater differences are observed between two countries. The countries structural convergence is always interpreted in the relation to the German economy (the reference object). As can be concluded from the Table 3, in the year 2000, Poland was the country which differed mostly to Germany – the distance was 65,8. The second worst country is Slovakia with the result of 53,8.We could state that in 2000, between Poland and Germany the structural differences were at the highest level of all cases included in the study. The country with the greatest structural similarity to Germany was Hungary – the distance was 41,2. From the table we can also conclude that in the group of four analyzed countries the greatest structural similarities are observed between Czech Republic and Slovak Republic – the distance only at 10,2; while the greatest structural differences were between Poland and Czech Republic – the distance at 34,5.

As following, the authors run analogues analysis for the data in 2007. The results are compiled in table 4 (see below).

TABLE 4.

Aggregate structural differences among selected countries. Reference country – Germany. Year 2007. Distance matrix (Euclidean distance).

	PL	HU	CZ	SK	*D*
PL	**0,0**	**36,2**	**30,2**	**23,0**	***73,3***
HU	36,2	**0,0**	**22,5**	**21,5**	***42,6***
CZ	30,2	22,5	**0,0**	**6,8**	***44,0***
SK	23,0	21,5	6,8	**0,0**	***59,8***
D	73,3	42,6	44,0	59,8	***0,0***

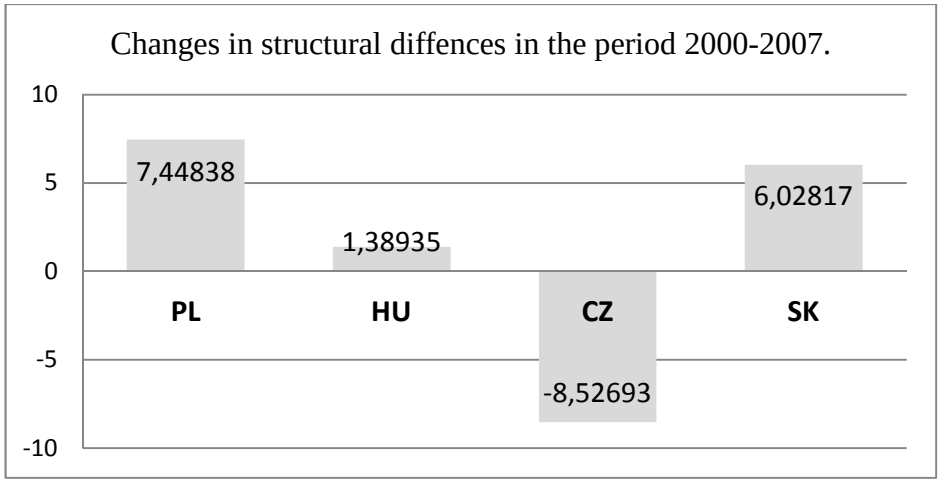
Source. Own calculations using *STATISTICA 9.0.*

In the year 2007, as in the 2000, the greatest structural differences were noted between Poland and Germany – the metric at 73,3. What is also worth to underline, the composite structural difference is greater in 2007, than it was in 2000. The change in the metric is (+7,4) – see chart X, which proofs that the relations between the two economies have diverged during the period of 2000-2007. Such change can be interpreted as growing divergence on the field of economy`s structure between Poland and Germany. Such "negative" change is also noted in case of Slovak Republic. In 2000, the Slovak Republic, was the second worst country, and in the 2007 it still not managed to change its position in the ranking. The change in metric for Slovak Republic is at (+6,0), which proofs the same worsening relation between Slovak Republic and Germany, like in the case of Poland and Germany. The country where the structural convergence can be easily observed is Czech Republic. The country in the period of 2000-2007 improved its relative position to German economy. The change in metric was at (-8,5), which proofs that the two economies are getting more and more similar in terms of their economies structures.

The Hungarian economy was slightly worse off in the 2007, than it was in 2000, when the relation to Germany is considered. The change in metric is at (+1,3). On such basis we cannot conclude about the crucial divergence or convergence when overall structure of the German and Hungarian economy is considered.

CHART 1.

Changes in the structural distance of Poland, Czech Rep., Hungary and Slovak Rep., with Germany as reference country. Changes in period 2000-2007.



Source: own elaboration.

As it is clearly visible from the results presented above, in case of 3 (out of 4) countries – namely Poland, Hungary and Slovak Republic, the structural convergence was not proofed. The distance between Germany and the three countries is growing in terms of structural similarities. Poland`s economy structure differs mostly, and what is even worst – the changes are not going the expected direction. In 2000 Poland`s economy structure was more similar to the German one, than after 8 sequent years. Only Czech Republic, has adjusted in terms of the economy structure to the Germany`s economy structure.

b) Structural convergence on disaggregate level

In the final part of the paper, the authors present results of some more detailed analysis. The structural convergence is tested in four separate dimensions. These are: value added in selected sectors as share of total value added generated in a given economy (1), value added per one person employed in selected sectors of national economy (2), share of persons employed in selected sectors to total employment (3), and share of export value in selected sectors to total export value in a given economy (4). For the analysis we apply analogous methodology. The country and data set are the same as applied in the previous section *(a)*.

Firstly the authors test the structural convergence in terms of value added in sectors as share of total values added. In the following tables 5 and 6, there are presented metrics (distances) for the years 2000 and 2007 respectively.

TABLE 5.

Structural differences among selected countries – VA in selected sectors as share of total VA. Reference country – Germany. Year 2000. Distance matrix (Euclidean distance).

	PL	HU	CZ	SK	D
PL	**0,0**	**3,08**	**13,9**	**5,1**	***7,8***
HU	3,1	**0,00**	**9,0**	**2,3**	***3,3***
CZ	13,9	9,03	**0,0**	**5,4**	***19,7***
SK	5,1	2,27	5,4	**0,0**	***10,5***
D	7,8	3,27	19,7	10,5	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

TABLE 6.

Structural differences among selected countries – VA in selected sectors as share of total VA. Reference country – Germany. Year 2007. Distance matrix (Euclidean distance).

	PL	HU	CZ	SK	D
PL	**0,0**	**5,84**	**10,5**	**6,0**	***14,7***
HU	5,8	**0,00**	**8,2**	**6,3**	***5,8***
CZ	10,5	8,22	**0,0**	**1,3**	***9,3***
SK	6,0	6,26	1,3	**0,0**	***12,0***
D	14,7	5,75	9,3	12,0	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

As an it can be concluded from the two tables 5 and 6, in 2000 the highest differences were observed between Germany in Czech Republic – the metric at 19,7. This year, Poland was the second best country in the ranking. After, in year 2007 Poland`s relative position changed significantly. In 2007 the country was in the last place in the ranking. The metric change was at (+6,9), which means that the Poland`s position has worsened crucially. Among the analyzed countries, only in case of Czech Republic it is right to draw a conclusion about

the structural convergence when the share of value added of total VA is taken into account. In case of the rest three countries, we would rather say about the divergence. Their structures, in 2007, were less similar than in 2000. The average distance for all country from Germany in 2000 was at 10,35, and in 2007 – (10,45). So on the average, the analyzed countries have not approached in term of the structural similarities to Germany.

Secondly, the structural convergence on the field of valued added in sectors per person employed was detected. In the following tables 7 and 8, there are presented results of the selected estimations.

TABLE 7.

Structural differences among selected countries – VA per person employed in sectors. Reference country – Germany. Year 2000. Distance matrix (Euclidean distance).

	PL	**HU**	**CZ**	**SK**	**D**
PL	**0,0**	**0,1**	**0,1**	**1,0**	***17,4***
HU	0,1	**0,0**	**0,0**	**0,9**	***17,2***
CZ	0,1	0,0	**0,0**	**1,1**	***16,3***
SK	1,0	0,9	1,1	**0,0**	***25,8***
D	17,4	17,2	16,3	25,8	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

TABLE 8.

Structural differences among selected countries – VA per person employed in sectors. Reference country – Germany. Year 2007. Distance matrix (Euclidean distance).

	PL	**HU**	**CZ**	**SK**	**D**
PL	**0,0**	**0,6**	**0,4**	**2,0**	***16,4***
HU	0,6	**0,0**	**0,1**	**3,2**	***13,1***
CZ	0,4	0,1	**0,0**	**3,3**	***12,4***
SK	2,0	3,2	3,3	**0,0**	***28,5***
D	16,4	13,1	12,4	28,5	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

In tables 7 and 8, there are presents results of estimations structural convergence on the field of value added per person employed in selected sectors. As compared to other cases the metrics reported are relatively very high. That proofs that in terms of valued added per person employed in selected sectors, the four analyzed countries are lagging far behind Germany. The overall results seem to be the worst of the rest of cases. However the distances are pretty high, it shall be stressed that in case of Poland, Czech Republic and Hungary, in the analyzed period the differences have diminished. Only in case of Slovakia we note worst results in 2007 than it was in 2000.

Next, there are presented results of structural convergence when employment in sectors to total employment is taken into account. In tables 9 and 10, there are results of estimations.

TABLE 9.

Structural convergence among selected economies – employment in sectors to total employment. Reference country – Germany. Year 2000. Distance matrix (Euclidean distance).

	PL	**HU**	**CZ**	**SK**	**D**
PL	**0,0**	**7,06**	**11,9**	**8,72**	***20,1***
HU	7,1	**0,00**	**2,2**	**0,24**	***8,8***
CZ	11,9	2,20	**0,0**	**1,06**	***11,4***
SK	8,7	0,24	1,1	**0,00**	***8,4***
D	20,1	8,85	11,4	8,43	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

TABLE 10.

Structural convergence among selected economies – employment in sectors to total employment. Reference country – Germany. Year 2007. Distance matrix (Euclidean distance).

	PL	**HU**	**CZ**	**SK**	**D**
PL	**0,0**	**5,94**	**10,7**	**7,84**	***20,6***
HU	5,9	**0,00**	**3,7**	**0,72**	***6,6***
CZ	10,7	3,67	**0,0**	**1,32**	***13,8***
SK	7,8	0,72	1,3	**0,00**	***8,8***
D	20,6	6,57	13,8	8,81	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

In the case of structural convergence on the field of share of persons employed in sectors to total employment, Poland`s position is relatively the worst of rest of cases. The metric for Poland in 2000, was at 20,1, and in 20007 – (20,6), while in case of Hungary the results were 8,8 and 6,6, respectively. Three out of four countries have worsened its relatively position to Germany, metrics reported in 2007 are higher than in 2000.

Finally, the authors have tested the structural convergence on the field of export value in selected sectors to total export value. In tables 10 and 11, there are put results of estimations.

TABLE 10.

Structural convergence among selected economies – export value in sectors to total export value. Reference country – Germany. Year 2000. Distance matrix (Euclidean distance).

	PL	HU	CZ	SK	D
PL	**0,0**	**20,5**	**8,6**	**14,2**	***20,5***
HU	20,5	**0,0**	**10,6**	**16,8**	***12,0***
CZ	8,6	10,6	**0,0**	**2,7**	***5,1***
SK	14,2	16,8	2,7	**0,0**	***9,1***
D	20,5	12,0	5,1	9,1	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

TABLE 11.

Structural convergence among selected economies – export value in sectors to total export value. Reference country – Germany. Year 2007. Distance matrix (Euclidean distance).

	PL	HU	CZ	SK	D
PL	**0,0**	**23,9**	**8,6**	**7,2**	***21,5***
HU	23,9	**0,0**	**10,5**	**11,4**	***17,2***
CZ	8,6	10,5	**0,0**	**0,8**	***8,5***
SK	7,2	11,4	0,8	**0,0**	***10,5***
D	21,5	17,2	8,5	10,5	***0,0***

Source. Own calculations using *STATISTICA 9.0.*

In case of export value in sectors to total export value, still the Poland`s positions results to be the worst of all. In 2000 the metric for Poland was at 20,5, while in 2007 – (21,5),comparing to the results of Czech Republic – (5,1) and (8,5) in respective years. That proofs little similarities both in relation to Germany, but also within the group of 4 countries.

In final part of the last section, the authors test for changes in metrics on 4 disaggregation level. The results of estimation are put in table 12 and also presented in chart 2.

TABLE 12.

Changes in metrics on different disaggregation levels. Start year – 2000, end year – 2007.

Country	A	B	C	D
Poland	6,9	**-1**	0,5	1
Hungary	2,5	**-4,1**	**-2,2**	5,2
Czech Republic	**-10,4**	**-3,9**	2,4	3,4
Slovak Republic	1,5	2,7	0,4	1,4

Legend:

(A) – Value added in sectors as share of total value added – changes in metrics; start year – 2000, end year – 2007.

(B) – Value added in sectors per person employed in sectors – changes in metrics; start year – 2000, end year – 2007.

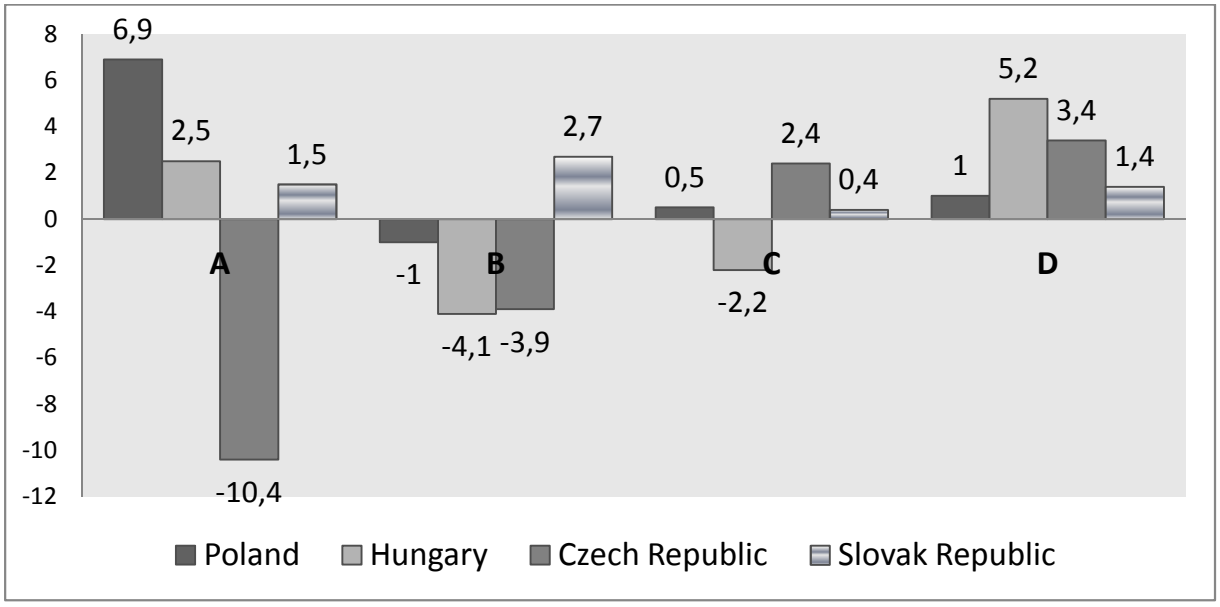
(C) – Share of persons employed in selected sectors to total employment – changes in metrics; start year – 2000, end year – 2007.

(D) – Share of export value in selected sectors to total export value - changes in metrics; start year – 2000, end year – 2007.

Source: own calculations.

CHART 2.

Structural convergence on disaggregate level. Changes in metrics. Start year – 2000, end year – 2007.



Source: own elaboration.

The negative values in Table 12, proof that a given country is better off in relation to Germany. Also on that basis we can conclude about the process of convergence or divergence among countries. The country which converges mostly with the German economy is Czech Republic. In three cases we note the negative changes in metric, which means that the country

is approaching Germany in terms of economic structure in selected dimensions. Also it must be stressed that in terms of dimension (A), Czech Republic has made the greatest progress, the change in metrics is at (-10,4). Hungary is the second best country in terms of convergence with Germany. Hungary improved their results in 2 out of 4 dimensions. Polish economy structure has hardly changed in relation to the German one in the analyzed period. In dimension (A), we note a significant and negative change – the metric has increased at (+6,9), which proofs greater divergence between these two countries. In the rest 3 dimensions the changes are slightly visible, that can be interpreted as if the structures of the two countries are at the comparable level of similarity. The Slovak Republic is the country which performs worst out of the 4 analysed. In all 4 dimensions we note an increase in metrics, which means that the country's relative position to Germany is rather worse in 2007, than in 2000. That proofs no convergence in terms of economy structure between Germany and Slovak Republic.

4. Final remarks.

The main aim of the paper was to test for structural convergence between four selected transition economies and Germany as the selected reference object. The authors purpose was also to learn about the structural convergence – or divergence – on disaggregate level. The results of multidimensional analysis, based on some arbitrary selected indicators, are the following:

- in the year 2000 the overall cohesion of the four countries with Germany was higher than in 2007,
- during the first decade of transformation (till 2000), the transition economies tented to converge structurally with the European countries, which was probably causes mainly by the high foreign direct investments inflows,
- among the four analyzed countries, Czech Republic economy converged structurally with Germany – concluded from the negative change in metrics` values,
- countries like: Poland, Hungary and Slovak Republic diverged structurally, in the analyzed period, with Germany – concluded from the positive changes in metrics` values,
- Poland was the country which economy structure diverged most significantly with Germany, compared to the rest of countries in the sample.

As a general conclusion it can be stated that in the period of 2000 – 2007, selected economies` structural convergence is not observed – except the case of Czech Republic. The economy

structure of Poland, Hungary and Slovak Republic was more similar to the Germany's once in 2000 than in 2007.

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STATISTICAL ANNEX

Table 1. Value added (VA) in selected sectors as share of total value added in Polish economy. Current prices. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[8]/total VA	5,0%	5,1%	4,5%	4,4%	5,1%	4,5%	4,3%	4,3%
VA in manufacturing/total VA	18,5%	16,8%	16,5%	17,7%	19,1%	18,5%	18,8%	18,9%
VA in services[9]/total VA	63,3%	65,4%	66,8%	66,0%	64,1%	64,8%	64,6%	64,0%
VA in low technology sector[10]/total VA	8,1%	7,5%	7,1%	7,2%	7,3%	7,4%	7,4%	7,3%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 2. Value added per one person employed in selected sectors. Expressed in Euro, current prices. Data for Poland. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[11]/employment in agriculture	3160	3739	3034	3254	4150	4157	4564	5549
VA in manufacturing/employment in manufacturing	10442	11796	11424	12633	14043	14708	15380	17234
VA in services[12]/employment in services	14936	18224	16661	16994	17655	19314	19934	22146
VA in low technology sector[13]/employment in low technology sector	8434	9702	9222	9655	10151	11299	11971	13506

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 3. Share of persons employed in selected sectors to total employment. Poland. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Employment in agriculture[14]/total employment	18,4%	19,1%	19,3%	18,4%	18,0%	17,4%	15,8%	14,7%
Employment in manufacturing/total employment	20,8%	20,0%	18,7%	19,1%	19,9%	20,1%	20,5%	20,7%
Employment in services/total employment	49,7%	50,4%	52,1%	53,0%	53,2%	53,5%	54,4%	54,6%
Employment in low technology sector/total	11,3%	10,8%	10,0%	10,2%	10,6%	10,5%	10,3%	10,3%

[8] Refers to agriculture, hunting, forestry and fishing
[9] Post-aggregation data
[10] Refers to agriculture, hunting, forestry and fishing
[11] Refers to agriculture, hunting, forestry and fishing
[12] Post-aggregation data
[13] Post-aggregation data
[14] Refers to agriculture, hunting, forestry and fishing

employment								

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 4. Share of export value in selected sectors to total export value. In USD, current prices. Poland. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Export value in agriculture[15]/total export value	1,5%	1,4%	1,6%	1,7%	1,8%	1,8%	1,6%	1,6%
Export value in manufacturing/total export value	94,5%	92,2%	94,5%	93,6%	94,4%	92,8%	94,2%	94,6%
Export value in high technology manufacturing/total export value	6,1%	6,3%	6,6%	6,1%	5,9%	6,0%	7,1%	7,8%
Export value in medium-high technology manufacturing/total export value	32,3%	30,7%	32,2%	33,5%	36,0%	36,6%	37,7%	38,1%
Export value in medium-low technology manufacturing/total export value	24,3%	25,1%	26,0%	24,9%	25,8%	24,5%	25,3%	25,1%
Export value in low technology manufacturing/total export value	31,9%	30,2%	29,7%	29,1%	26,7%	25,6%	24,1%	23,6%

Source: own calculations based on data drawn from OECD STAN Bilateral Trade, www.oecd.org, 2011

Table 5. Value added (VA) in selected sectors as share of total value added in Hungarian economy. Current prices. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
VA in agriculture[16]/total VA	5,4%	5,2%	4,6%	4,3%	4,8%	4,2%	4,0%	4,0%
VA in manufacturing/total VA	23,1%	22,4%	21,5%	21,8%	22,4%	22,3%	22,8%	22,2%
VA in services[17]/total VA	62,8%	64,1%	65,5%	66,0%	64,7%	65,6%	65,7%	66,2%
VA in low technology sector[18]/total VA	7,0%	7,3%	6,9%	6,2%	5,6%	5,1%	5,0%	4,7%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

[15] Refers to agriculture, hunting, forestry and fishing
[16] Refers to agriculture, hunting, forestry and fishing
[17] Post-aggregation data
[18] Refers to agriculture, hunting, forestry and fishing

Table 6. Value added per one person employed in selected sectors. Expressed in Euro, current prices. Data for Hungary. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[19]/employment in agriculture	9138	11611	12133	12286	17093	16223	17217	18693
VA in manufacturing/employment in manufacturing	10595	12584	14209	14517	18170	19246	21629	21994
VA in services[20]/employment in services	11752	15045	17984	16934	19457	20111	21794	23177
VA in low technology sector[21]/employment in low technology sector	6727	8914	9981	9220	10566	10419	11504	11864

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 7. Share of persons employed in selected sectors to total employment. Hungary. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Employment in agriculture[22]/total employment	6,6%	6,3%	6,2%	5,5%	5,3%	5,0%	4,9%	4,7%
Employment in manufacturing/total employment	24,3%	24,9%	24,8%	23,6%	22,9%	22,3%	22,0%	22,2%
Employment in services/total employment	59,6%	59,5%	59,7%	61,2%	61,9%	62,7%	62,9%	62,8%
Employment in low technology sector/total employment	11,5%	11,5%	11,4%	10,5%	9,9%	9,4%	9,0%	8,8%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 8. Share of export value in selected sectors to total export value. In USD, current prices. Hungary. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Export value in agriculture[23]/total export value	2,6%	2,9%	2,8%	2,6%	2,4%	2,2%	2,1%	2,9%
Export value in manufacturing/total export value	96,6%	95,3%	95,7%	95,9%	96,3%	96,1%	91,3%	95,0%
Export value in high technology manufacturing/total export value	29,6%	27,0%	28,7%	30,9%	33,5%	30,6%	29,3%	28,8%
Export value in medium-high technology manufacturing/total export value	38,1%	38,5%	38,2%	38,8%	38,1%	39,0%	40,2%	41,5%

[19] Refers to agriculture, hunting, forestry and fishing
[20] Post-aggregation data
[21] Post-aggregation data
[22] Refers to agriculture, hunting, forestry and fishing
[23] Refers to agriculture, hunting, forestry and fishing

Export value in medium-low technology manufacturing/total export value	10,8%	10,7%	10,3%	10,6%	10,8%	11,4%	11,1%	11,4%
Export value in low technology manufacturing/total export value	18,0%	19,0%	18,3%	15,6%	13,7%	12,5%	10,7%	10,4%

Source: own calculations based on data drawn from OECD STAN Bilateral Trade, www.oecd.org, 2011

Table 9. Value added (VA) in selected sectors as share of total value added in Czech economy. Current prices. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
VA in agriculture[24]/total VA	3,9%	3,9%	3,3%	3,1%	3,3%	3,0%	2,6%	2,5%
VA in manufacturing/total VA	26,8%	26,4%	25,4%	24,7%	26,8%	26,3%	26,3%	26,5%
VA in services[25]/total VA	58,0%	58,3%	60,0%	61,0%	58,1%	59,1%	59,2%	59,1%
VA in low technology sector[26]/total VA	8,7%	8,7%	8,7%	7,8%	8,0%	7,5%	7,0%	6,7%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 10. Value added per one person employed in selected sectors. Expressed in Euro, current prices. Data for Czech Republic. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
VA in agriculture[27]/employment in agriculture	9249	11505	10924	10981	13858	14623	14488	15675
VA in manufacturing/employment in manufacturing	11104	12619	12999	13203	16477	17726	19863	22206
VA in services[28]/employment in services	11858	13945	15026	15587	16999	18851	21235	23155
VA in low technology sector[29]/employment in low technology sector	9578	11232	12054	11507	13757	14740	16178	17691

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

[24] Refers to agriculture, hunting, forestry and fishing
[25] Post-aggregation data
[26] Refers to agriculture, hunting, forestry and fishing
[27] Refers to agriculture, hunting, forestry and fishing
[28] Post-aggregation data
[29] Post-aggregation data

Table 11. Share of persons employed in selected sectors to total employment. Czech Republic. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Employment in agriculture[30]/total employment	4,8%	4,6%	4,3%	4,2%	4,0%	3,8%	3,7%	3,6%
Employment in manufacturing/total employment	27,7%	28,1%	27,8%	27,4%	27,4%	27,5%	27,6%	27,3%
Employment in services/total employment	56,0%	56,2%	56,9%	57,5%	57,6%	57,9%	58,0%	58,3%
Employment in low technology sector/total employment	10,4%	10,4%	10,3%	10,0%	9,8%	9,4%	9,0%	8,7%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 12. Share of export value in selected sectors to total export value. In USD, current prices. Czech Republic. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Export value in agriculture[31]/total export value	1,6%	1,1%	1,0%	1,1%	1,0%	1,3%	1,1%	1,2%
Export value in manufacturing/total export value	95,9%	96,4%	96,4%	96,1%	96,1%	95,5%	95,6%	95,8%
Export value in high technology manufacturing/total export value	9,1%	11,6%	14,3%	14,2%	15,8%	14,6%	16,4%	18,0%
Export value in medium-high technology manufacturing/total export value	43,6%	43,3%	42,4%	43,0%	42,7%	43,0%	43,3%	43,4%
Export value in medium-low technology manufacturing/total export value	23,5%	22,6%	22,1%	22,0%	21,8%	21,2%	20,3%	20,0%
Export value in low technology manufacturing/total export value	19,7%	18,8%	17,6%	17,0%	15,8%	15,7%	14,6%	14,5%

Source: own calculations based on data drawn from OECD STAN Bilateral Trade, www.oecd.org, 2011

Table 13. Value added (VA) in selected sectors as share of total value added in Slovak economy. Current prices. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[32]/total VA	4,5%	4,7%	5,1%	4,5%	4,1%	3,7%	3,6%	3,5%
VA in manufacturing/total VA	24,7%	25,3%	22,8%	23,4%	24,0%	24,1%	24,1%	24,2%

[30] Refers to agriculture, hunting, forestry and fishing
[31] Refers to agriculture, hunting, forestry and fishing
[32] Refers to agriculture, hunting, forestry and fishing

VA in services[33]/total VA	59,3%	60,4%	60,9%	60,5%	59,3%	59,8%	57,4%	57,7%
VA in low technology sector[34]/total VA	8,5%	9,0%	7,5%	7,3%	7,1%	7,2%	7,1%	6,7%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 14. Value added per one person employed in selected sectors. Expressed in Euro, current prices. Data for Slovakia. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
VA in agriculture[35]/employment in agriculture	244	304	396	431	456	462	609	733
VA in manufacturing/employment in manufacturing	303	351	358	398	486	547	673	750
VA in services[36]/employment in services	311	353	391	426	494	539	625	706
VA in low technology sector[37]/employment in low technology sector	241	291	272	290	345	400	498	565

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 15. Share of persons employed in selected sectors to total employment. Slovakia. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Employment in agriculture[38]/total employment	5,7%	5,4%	5,0%	4,5%	4,5%	4,4%	4,0%	3,6%
Employment in manufacturing/total employment	25,4%	25,4%	24,9%	25,2%	25,0%	24,5%	24,3%	24,5%
Employment in services/total employment	59,4%	60,2%	60,9%	60,9%	60,9%	61,6%	62,1%	62,1%
Employment in low technology sector/total employment	11,0%	10,8%	10,7%	10,7%	10,4%	9,9%	9,6%	9,1%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

[33] Post-aggregation data
[34] Refers to agriculture, hunting, forestry and fishing
[35] Refers to agriculture, hunting, forestry and fishing
[36] Post-aggregation data
[37] Post-aggregation data
[38] Refers to agriculture, hunting, forestry and fishing

Table 16. Share of export value in selected sectors to total export value. In USD, current prices. Slovakia. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Export value in agriculture[39]/total export value	1,3%	1,3%	1,2%	1,0%	1,1%	1,7%	1,6%	1,4%
Export value in manufacturing/total export value	97,3%	97,2%	96,9%	97,2%	96,4%	95,9%	94,3%	95,5%
Export value in high technology manufacturing/total export value	5,0%	5,9%	5,3%	5,6%	7,3%	11,0%	14,1%	16,4%
Export value in medium-high technology manufacturing/total export value	43,5%	41,4%	42,3%	47,8%	44,7%	39,9%	40,2%	42,0%
Export value in medium-low technology manufacturing/total export value	28,7%	28,4%	27,6%	24,9%	26,9%	27,9%	25,6%	24,0%
Export value in low technology manufacturing/total export value	20,1%	21,4%	21,7%	18,9%	17,5%	17,0%	14,4%	13,3%

Source: own calculations based on data drawn from OECD STAN Bilateral Trade, www.oecd.org, 2011

Table 17. Value added (VA) in selected sectors as share of total value added in German economy. Current prices. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[40]/total VA	1,3%	1,4%	1,1%	1,0%	1,1%	0,9%	0,8%	1,0%
VA in manufacturing/total VA	22,9%	22,8%	22,4%	22,4%	22,6%	22,7%	23,3%	23,8%
VA in services[41]/total VA	68,5%	69,0%	69,7%	70,2%	69,6%	70,0%	69,3%	68,6%
VA in low technology sector[42]/total VA	5,5%	5,3%	5,1%	4,9%	4,9%	4,8%	4,7%	4,6%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 18. Value added per one person employed in selected sectors. Expressed in Euro, current prices. Data for Germany. Years 2000-2007.

	2000	2001	2002	2003	2004	2005	2006	2007
VA in agriculture[43]/employment in agriculture	49703	56391	48811	42494	47921	39728	40782	47056
VA in manufacturing/employment in manufacturing	54614	55519	56594	58597	61785	63840	68798	71745

[39] Refers to agriculture, hunting, forestry and fishing
[40] Refers to agriculture, hunting, forestry and fishing
[41] Post-aggregation data
[42] Refers to agriculture, hunting, forestry and fishing
[43] Refers to agriculture, hunting, forestry and fishing

VA in services[44]/employment in services	52602	53703	54858	55905	56436	57259	58092	58677
VA in low technology sector[45]/employment in low technology sector	44286	44394	44284	45002	46731	47517	49461	50030

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 19. Share of persons employed in selected sectors to total employment. Germany. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Employment in agriculture[46]/total employment	1,3%	1,3%	1,3%	1,3%	1,3%	1,3%	1,3%	1,3%
Employment in manufacturing/total employment	22,1%	22,2%	21,8%	21,5%	21,1%	20,8%	20,5%	20,5%
Employment in services/total employment	68,6%	69,2%	70,0%	70,6%	71,1%	71,7%	72,2%	72,3%
Employment in low technology sector/total employment	6,5%	6,4%	6,3%	6,1%	6,0%	5,9%	5,7%	5,7%

Source: own calculations based on data drawn from OECD STAN Database for Structural Analysis, www.oecd.org, 2011

Table 20. Share of export value in selected sectors to total export value. In USD, current prices. Germany. Years 2000-2007.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Export value in agriculture[47]/total export value	0,9%	0,8%	0,8%	0,7%	0,7%	0,8%	0,7%	0,7%
Export value in manufacturing/total export value	96,0%	96,1%	96,5%	93,0%	92,5%	94,5%	95,2%	91,2%
Export value in high technology manufacturing/total export value	19,1%	19,6%	18,5%	17,6%	18,5%	19,0%	18,7%	17,3%
Export value in medium-high technology manufacturing/total export value	48,0%	48,1%	49,1%	47,9%	47,0%	48,3%	47,4%	46,7%
Export value in medium-low technology manufacturing/total export value	14,1%	13,9%	14,2%	13,5%	14,0%	15,0%	16,0%	15,9%
Export value in low technology manufacturing/total export value	13,4%	13,2%	13,4%	12,7%	12,0%	12,6%	12,2%	11,9%

Source: own calculations based on data drawn from OECD STAN Bilateral Trade, www.oecd.org, 2011

[44] Post-aggregation data
[45] Post-aggregation data
[46] Refers to agriculture, hunting, forestry and fishing
[47] Refers to agriculture, hunting, forestry and fishing

Table 21. Exchange rates applied for converting national currencies into Euros. European Central Bank. Exchanges rates for period 2000-2007 (December). 1 Euro = [X] units of national currency.

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Poland	3,84	3,49	4	4,01	4,074	3,86	3,82	3,59
Czech Republic	35,06	31,96	31,48	32,41	30,39	29,01	27,48	26,62
Hungary	265,1	245,18	235,95	262,5	245,63	252,51	251,77	253,73
Slovak Republic	43,99	42,79	41,68	41,17	38,71	37,87	34,43	33,58

Source: European Central Bank, currency exchange databases, 2011.